NATIONAL RADIO ASTRONOMY OBSERVATORY

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31 January 2012

Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of	)	
	)	
Amendment of the Commission's	)	WT Docket No. 11-202
Rules to Permit Radiolocation	)	
Operations in the 78-81 GHz Band	)	
	)	
Request by the Trex Enterprises	)	RM-11612
Corporation for Waiver of Section	)	
90.103(b) of the Commission's	)	
Rules		

Comments of the
National Radio Astronomy Observatory
Charlottesville, VA 22903

Introduction

1. Here, the National Radio Astronomy Observatory ("NRAO" or "the Observatory") provides its comments responding to the Commission's Notice of Proposed Rule Making and Order FCC 11-185 ("the NPRM&O") regarding a waiver request by Trex Enterprises Corporation and amendment of the Commission's rules to permit radiolocation operations in the 78–81 GHz band.

2. NRAO (http://www.nrao.edu), operated by Associated Universities, Inc. (AUI), (http://www.aui.edu) under a cooperative agreement with the National Science Foundation, is the largest observatory dedicated to radio astronomy and one of the largest astronomical observatories in the world. NRAO operates one dozen radio astronomy stations in rural and remote regions of the United States that stand to be affected to varying degrees by proposed changes in rules for operation of radiolocation devices in the λ4mm (~75 GHz) waveband. NRAO also functions as the North American partner in the ALMA mm/sub-mm telescope currently nearing completion in the Atacama Desert in Chile (http://www.almaobservatory.org).

3. The NRPRM&O addresses a wide variety of regulatory concerns; how Trex should coordinate operation of its Foreign Object Debris (FOD) radar; whether Trex and/or others should operate under Part 90 (licensed) or Part 15 rules; in which bands

(perhaps extending to 76 GHz) and at which locations FOD and other radiolocation services should be allowed to operate, etc. Only a few aspects are discussed here.

Trex waiver request and coordination mechanism

4. The Observatory remains supportive of the request by Trex to operate 78-81 GHz FOD radar at airports, with suitable coordination. This coordination need not be onerous given the small number of potentially-affected radio astronomy sites. Either the mechanism suggested by Trex, akin to ESV operations, or via the NTIA as proposed by the Commission, would provide for protection of radio astronomy operations.

5. Consistent with its prior comments on tank level probing radars (TLPR) in ET Docket No. 07-96, NRAO notes that fixed-location operation of devices having technical performance criteria like those described at ¶18 of the NPRM&O has the potential for creating permanent sources of serious interference to radio astronomy operations. Operation of such devices at fixed locations should generally not be allowed within line of sight of radio astronomy stations, except perhaps after suitable coordination.

Other issues: Special considerations for protection of radio astronomy engendered by radiolocation operation at frequencies 76 – 81 GHz

6. Portions of the spectrum from 76 to 81 GHz are used by various radars, for instance vehicular long and short range radars, TLPR, FOD radar, etc., some of which will operate outdoors and some of which will operate under Part 15 of the Commission's rules. Indeed, new uses of this spectrum are so numerous that prospective operators now attempt to stake out positions that might protect their operations from interference even when asking for their initial waivers. It is remarkable that spectrum bands at such high frequencies (by commercial standards) are now subject to intense competition.

7. When the Commission discusses the mm-wave spectrum it sometimes notes that applications in those bands benefit from the narrow beams that accrue to operation at short wavelengths. Devices with narrow beams tend to have higher equivalent isotropically-radiated power (eirp), with the consequence that relatively compact low-power mm-wave devices pose a threat of doing actual physical damage to radio astronomy receivers when strong interference occurs. This contrasts with interference scenarios with portable devices at lower frequencies, for instance cell phone handsets, whose total output power may be higher but which operate with relatively little gain.

8. For instance, a generic device operating at 79 GHz with 100 mW output and 45 dBi gain (see ¶18 of the NPRM&O) nominally focuses its power into a half-power beam width of 1.01^{o} using a circular aperture of only 8.5". By comparison, the dish of a 12m radio astronomy antenna subtends 1^{o} when viewed face-on at a distance of 690m. Thus a very compact 79 GHz device can focus most of its output onto the receiving surface of a 12m radio astronomy antenna when operating within 0.7km.

9. Now consider that a 79 GHz radio astronomy receiver can be burned out by an input power of 25mW according to ITU-R Report RA. 2188 (available without cost at

http://www.itu.int/pub/R-REP-RA/publications.aspx?lang=en&parent=R-REP-RA.2188). Thus, unfettered operation of a 100 mW, 79 GHz device within 0.7km of a 12m radio astronomy antenna has the potential to do actual physical damage, while proportionally longer distances would apply to the NRAO 25m diameter VLBA antennas and the 100m Robert C. Byrd Green Bank Telescope in West Virginia. Of course the required standoff distances to prevent harmful RFI would be much longer.

Summary and conclusions

10. Whatever are the rules finally decided by the Commission, steps should be taken to ensure that mm-wave radiolocation devices do not operate at fixed locations within line of sight of radio astronomy antennas (except perhaps with suitable coordination) and moreover that appropriate separation distances with radio astronomy antennas are maintained. At these high frequencies there is more at stake for radio astronomy than just protection from harmful interference.

Respectfully submitted,
National Radio Astronomy Observatory

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